*Final Report: Investment in the Office Du Niger*

# Proposal for A Non-Bank Financial Institution:

# Δ PROMI

*Policy Analyses and Private Sector Strengthening*


**SUBMITTED TO**
USAID/Mali

**SUBMITTED BY**
Nathan–MSI Group
J. Dirck Stryker
Associates for International Resources and Development (AIRD), Cambridge, MA

Massa Coulibaly, Kim Forsyth and Kadidia Konaré
Groupe de Recherche en Economie Appliqué et Théorique (GREAT), Bamako, Mali

**IN RESPONSE TO**

## TABLE OF CONTENTS



# EXECUTIVE SUMMARY

Over the past two decades, irrigated cultivation within the Office du Niger in Mali has achieved remarkable success. The total area under irrigation increased from 35,181 hectares in 1982-83 to 52,995 hectares in 2000-01. Even more important, average yields of rice paddy grew from 1.6 metric tons per hectare in 1982-83 to 6.1 mt/ha in 2000-01. The result was almost a six-fold increase in production from 56,500 mt in 1982-83 to 325,300 mt in 2000-01.

This success was due to a number of factors. First, irrigation infrastructure on a total of 29,740 hectares was rehabilitated. Second, production was intensified substantially. For example, average farm sized was reduced from 6.4 hectares in 1982-83 to 2.4 hectares in 2000-01, inputs of fertilizer were expanded dramatically, and transplanting was adopted almost everywhere. Finally, liberalization of marketing, input supply, and processing had a very salutary effect.

Yet further development within the Office du Niger faces a number of constraints. The area that has been developed thus far is much less than that which could potentially be cultivated -- close to one million hectares. Even taking into consideration limitations of water, at least 250,000 to 300,000 hectares could be developed and receive adequate water for irrigation.

One of the most important constraints to developing this potential is the availability of financing. Although donor support is available for developing the primary irrigation system, there is a reluctance to go beyond this to include development of irrigation at the secondary and tertiary levels, as well as leveling of land and other steps required to prepare the land for cultivation. There is a sense that this ought to be undertaken by the private sector. In fact, the Government of Mali has made this division of responsibility its official policy insofar as private investment is concerned.

This report examines the question of how medium and long term lending to the private sector can be increased in the Office du Niger for the purpose of facilitating investment in irrigation infrastructure, land development, and agricultural equipment in order to more fully develop the potential that exists for irrigated agriculture. The report offers a series of recommendations regarding the creation of a non-bank financial institution (NBFI, or *établissement financier*) that would serve the Delta region of Mali, and in particular the zone of the Office du Niger. This institution would have a broad base of equity capital, would borrow on regional capital markets, and would direct its lending primarily towards investment in irrigation infrastructure, land development, and agricultural and processing equipment. It would receive borrowing guarantees from the donors, the International Finance Corporation, and other regional and international financial institutions but would be independent of the Malian government. The major goal would be to create a financial structure and to engage in financial operations in such a way as to become a viable financial intermediary serving the needs of the Office du Niger region.

The analysis presented in this report suggests that it should be financially feasible to expand irrigation in the Office du Niger and to have all costs of investment in secondary and tertiary irrigation infrastructure and land development paid for by the farmers involved. However, this will require that yields be maintained close to the level of 6 tons/ha, which is currently the average in the Office. This means that transplanting will probably have to be continued for the

foreseeable future. This is entirely consistent with the use of power tillers (*motoculteurs*) but may be more difficult if tractor cultivation is introduced on a large scale. Efforts to combine tractor cultivation with transplanting should be encouraged, even if this means that the size of operating units must be kept reasonably small.

The farm-level analysis suggests that market interest rates of about 12% can be paid, but that this will require that the duration of the loan must be lengthened up to 8-10 years for power tiller operations, 15 years for tractor cultivation with transplanting, and 20 years for manual cultivation. Sensitivity analysis was performed to see if this interest rate could be raised in order to cover known risks. The answer is yes, but only up to a point. That is, beyond 14-15%, the internal rate of return is substantially decreased and cash flow problems begin to be encountered.

The report surveys existing sources of finance within the Delta region and concludes that it is highly unlikely that the BNDA or another commercial bank will be interested in the type of loans needed to finance these investments. The report also suggests that it is highly desirable to build on the very successful, albeit short, experience of FCRMD in extending five-year loans to farmers. Most important is to focus on existing farmers with at least two years of experience in the Office. These farmers currently would like to develop at least 1000 additional hectares of irrigated land if they could obtain the financing. As experience is gained, it is likely that this number will increase.

The report therefore proposes the creation of a non-bank financial institution, or *établissement financier*, within the region. This institution is referred to provisionally as Δ PROMI. It would furnish 8-10 year loans for secondary and tertiary irrigation infrastructure and land development, as well as medium-term loans (3-year) for the purchase of production and processing equipment. Lending would be focused on existing farmers with at least two years of experience in the Office. Others could apply but their applications would face greater scrutiny.

According to the illustrative analysis of Section III, resources initially required for Δ PROMI include 1.2 billion CFAF in subscribed capital and 2 billion CFAF in 10-year loans from BOAD, BAD, or other lending agencies. The capital subscription appears feasible according to the interviews and other information acquired regarding possible sources of capital. The loans can be guaranteed, as required, by various funds within West Africa or by USAID's Office of Credit and Investment. In addition, according to the analysis, donors are expected to pay for the first five years of overhead costs (not inclusive of the cost of administering the loans), which amounts to 330 million CFAF, or about 450,000 US dollars.

From the fourth year of operations, Δ PROMI starts to float bonds on the West African capital market, with a guarantee from the IFC. The cost of interest on the bonds plus the guarantee fee saves little initially over borrowing directly from BOAD , BAD, etc. in the form of a loan, but these costs should be reduced as the financial viability of Δ PROMI is established and guarantee fees are decreased or guarantee requirements are lessened. This is in line with the move towards disclosure as the guiding principle for efficient resource allocation within this capital market.

There are a number of issues that need to be resolved in the process of moving forward to create Δ PROMI. One of the thorniest potential issues in the Office du Niger is that of land tenure. While financing of private sector investment in irrigation infrastructure does not appear to be threatened by lack of secure land tenure at present, given all the other problems such financing faces, lack of secure title could become a problem in the future. If Δ PROMI is to lend to farmers who are investing in irrigation and developing the land within the Office du Niger, its investors and lenders are going to require that it hold secure title to that land until the loans are repaid.

The are several issues that need to be resolved regarding the relationship between Δ PROMI and the National Rural Infrastructure Project. One is fairly simple. Under the project, the Government of Mali is to set up an autonomous public works agency (*Agence d'Exécution de Travaux d'Infrastructures et d'Equipements Ruraux*, or AGETIER), which will undertake the necessary infrastructure construction. It is presumed that these services can be priced and made available to private farmers for cash payment, which may be borrowed from Δ PROMI. In addition, it is also possible that private contractors could undertake the work under the supervision of AGETIER or the Office du Niger.

What may be more of a problem is to assure that the payments being made by farmers to the institution responsible for managing the financing of investments are consistent with those being paid by farmers to Δ PROMI. A second problem arises because the FCRMD loans being financed in part by USAID are not consistent with the general principle that all secondary and tertiary irrigation construction must ultimately be recovered from the farmer. Furthermore, the rate of interest being charged is below that which is sustainable according to market principles. Although this program has been very important as a pilot effort, consistency must be established with the national policy regarding cost recovery and the interest rate to be charged.

The analysis contained in Tables 6-8 assumes over 20 years that 11,400 hectares of land will be place under irrigation using loans from Δ PROMI. At six tons per hectare, this implies that roughly an additional 70,000 tons of paddy will be produced. This is very modest relative to the potential that exists at the Office du Niger. Current planning, in fact, calls for irrigation to be extended over 120,000 hectares during the next 20 years. It should be recognized, however, that this is only one way in which expansion will occur. To the investments financed by Δ PROMI will be added the land put under irrigation as community perimeters, lease-purchase arrangements, and other private sector investments. Furthermore, to the extent that Δ PROMI is successful, this model can be expanded as rapidly as the availability of financial resources and the demand for loans will permit.

The following recommendations are made regarding action to be taken in light of the analysis presented in this report.

1. The place of Δ PROMI within the broader range of options for financing investment in irrigation beyond the primary level in the Office du Niger needs to be clarified. Among the options that should be considered is that of combining the type of financial institution

proposed here with the financing mechanism being studied within the context of the National Rural Infrastructure Project.

2. Efforts should be made to define clearly the extent to which and under what circumstances the cost of investment in secondary and tertiary irrigation infrastructure and land development is to be paid for by farmers in the Office du Niger. In addition, policies regarding subsidies on interest rates, risk guarantees, and other important variables need to be made clear and uniform across donors and the government.

3. Various options need to be explored regarding titling of land in the Office du Niger and which of these options is acceptable from the perspective of a newly established agency for furnishing farmers with medium and long-term loans for the purpose of investing in equipment and irrigation infrastructure in the Office. The consequences of each of these options for obtaining equity capital, loans, authority to issue bonds, and loan and bond guarantees needs to be assessed.

4. A feasibility study should be undertaken regarding the viability of establishing an *établissement financier* (EF) along the lines suggested in this report for Δ PROMI.

# PRIVATE SECTOR INVESTMENT IN THE OFFICE DU NIGER PROPOSAL FOR A NON-BANK FINANCIAL INSTITUTION

## I. INTRODUCTION

Over the past two decades, irrigated cultivation within the Office du Niger in Mali has achieved remarkable success. The total area under irrigation increased from 35,181 hectares in 1982-83 to 52,995 hectares in 2000-01.[1] Even more important, average yields of rice paddy grew from 1.6 metric tons per hectare in 1982-83 to 6.1 mt/ha in 2000-01. The result was almost a six-fold increase in production from 56,500 mt in 1982-83 to 325,300 mt in 2000-01.

This success was due to a number of factors. First, irrigation infrastructure on a total of 29,740 hectares was rehabilitated. Second, production was intensified substantially. For example, average farm sized was reduced from 6.4 hectares in 1982-83 to 2.4 hectares in 2000-01, inputs of fertilizer were expanded dramatically, and transplanting was adopted almost everywhere. Finally, liberalization of marketing, input supply, and processing had a very salutary effect.

Yet further development within the Office du Niger faces a number of constraints. The area that has been developed thus far is much less than that which could potentially be cultivated -- close to one million hectares (Diallo, 1999, p. 1). Even taking into consideration limitations of water, at least 250,000 to 300,000 hectares could be developed and receive adequate water for irrigation. On the basis of existing primary irrigation infrastructure, only, the area under irrigated cultivation could be more than doubled at a cost of 2-3 million FCFA/ha (World Bank, 2000, p. 4).

One of the most important constraints to developing this potential is the availability of financing. Although donor support is available for developing the primary irrigation system, there is a reluctance to go beyond this to include development of irrigation at the secondary and tertiary levels, as well as leveling of land and other steps required to prepare the land for cultivation. There is a sense that this ought to be undertaken by the private sector. In fact, the Government of Mali has made this division of responsibility its official policy insofar as private investment is concerned (République du Mali, 1999b, p. 35). The policy is less clear for community perimeters and for lease-purchase arrangements.[2]

[1] The data in this section were provided by the Office du Niger.

[2] Most investment in community perimeters is to be undertaken by the State, with the exception of that which can be done by the farmers themselves and that part of the State's investment which can reasonably be recovered from the farmers. Under lease-purchase arrangements, the State undertakes all investment but the farmer repays part of that investment. The precise extent of the repayment to the State is unclear in the National Strategy for the Development of Irrigation (République du Mali, 1999b, p. 35) In the project appraisal document for the National Rural Infrastructure Project, the government is expected to fully recover its cost for secondary irrigation investment under lease-purchase arrangements, and its cost for tertiary infrastructure and parcel-level development in both lease-purchase arrangements and community perimeters (World Bank, 2000, p. 8).

One key question is the capacity of farmers to repay the cost of secondary and tertiary irrigation infrastructure, as well as all investment costs at the level of the parcel. In addition to the per hectare charge usually assessed for operation and maintenance of the irrigation system, the farmer has to pay all costs associated with preparing the land, cultivating the crop, and harvesting and transporting it. Although yields have increased markedly in the past few years, it still is not fully evident whether the value of output is sufficient to pay for all these investment costs.[3]

Although the State will finance most investment in irrigation infrastructure and land development for community perimeters and lease-purchase arrangements, through the constitution of a financing mechanism which is still to be defined, private operators are expected to find their own sources of financing. However, a study of the Test Perimeter at Koumouna suggests that few of those who have applied for land under this scheme have the experience and financing required for this type of investment. Most of these prospective entrepreneurs have not previously operated within the Office du Niger. Despite this, many of them propose to develop in excess of 100 hectares (République du Mali, 1999a).

Other farmers, who have had long experience in the Office du Niger, are somewhat more modest in their plans. Many of these farmers want to expand the area that they cultivate and to upgrade the equipment they are using. Some want to use power-tillers for land preparation, which normally is more thorough than hand cultivation and results in a substantial increase in yields. Others desire to move toward land preparation by tractor and direct seeding, which lowers yields somewhat but increases the area that can be cultivated. These farmers have received financing from the *Fédération des Caisses Rurales Mutualists du Delta* (FCRMD), supported in this credit operation by USAID. The loans, which have generally been used thus far only to pay for investment in tertiary irrigation infrastructure, are normally for five years at an interest rate of 9 % and with a grace period of one year.

One of the key issues involved in lending in the Office du Niger has been land tenure arrangements. Some have argued that long-term financing has been limited, particularly on large-scale irrigation schemes, by the absence of secure title to the land by private investors. On the other hand, because of its investment in the primary irrigation network, the Office du Niger has been reluctant to turn land over to investors prior to being assured that the land will be developed by them for irrigated cultivation as intended.

This report examines the question of how medium and long term lending to the private sector can be increased in the Office du Niger for the purpose of facilitating investment in irrigation infrastructure, land development, and agricultural equipment in order to more fully develop the potential that exists for irrigated agriculture. The report is based on extensive documentation and discussions with Malian farmers, government officials, bankers, and financial and business leaders, as well as staff members of the World Bank, International Finance Corporation, West Africa regional stock exchange, and others active in the West African and international capital markets.

[3] The analysis of farm budgets undertaken for the appraisal report suggests that farmers would be able to pay only one-half of the cost of secondary infrastructure investment, and that using a relatively low interest rate of 8% (World Bank, 2000, p. 52).

The report offers a series of recommendations regarding the creation of a non-bank financial institution (NBFI, or *établissement financier*) that would serve the Delta region of Mali, and in particular the zone of the Office du Niger. This institution would have a broad base of equity capital, would borrow on Malian and regional capital markets, and would direct its lending primarily towards investment in irrigation infrastructure, land development, and agricultural and processing equipment. It would receive borrowing guarantees from the donors, the International Finance Corporation, and other regional and international financial institutions but would be independent of the Malian government. The major goal would be to create a financial structure and to engage in financial operations in such a way as to become a viable financial intermediary serving the needs of the Office du Niger region.

The next section of the report surveys the range of potential borrowers in the Office du Niger and their needs for medium and long-term finance. The capacity of these borrowers to pay for investment costs is analyzed in terms of the particular modes of production likely to be employed, rates of interest, and other conditions of borrowing. The section looks at existing sources of finance in the region and analyzes their suitability for meeting the needs of these borrowers. It proposes the establishment of a specialized non-bank financial institution for the promotion of investments in the Delta (hereafter referred to as *Promotion de l'Investissement dans le Delta*, or **Δ** PROMI) to meet these needs based on existing experience in the region.

Section III examines the various types of risk for the NBFI and how they can be minimized. It analyzes alternative sources of capital, the requirements they impose, and the conditions necessary for Δ PROMI is to be viable over the longer run. A financial analysis is undertaken of the feasibility of establishing Δ PROMI under these conditions and of earning a reasonable rate of return for its stockholders. This is followed by a concluding section, which sets out a number of issues and proposes some next steps.

The analysis in this report is but the first step towards establishing a financial structure capable of meeting the needs of existing and potential farmers in the Office du Niger. The analysis is exploratory in nature and designed to bring together a number of disparate elements related to agricultural production, existing financial constraints, and capital market opportunities. The next step will be to integrate the analysis here with the broader ongoing assessment of options for financing investment in irrigation, as well as to undertake a detailed feasibility study involving both financial and institutional analyses.

# II. FEASIBILITY OF MEDIUM AND LONG-TERM FINANCE

The need for medium and long-term financing in the Office du Niger derives from the nature of production in the region. Investment in irrigation infrastructure is costly but can last many years if properly maintained. Unfortunately, existing financial institutions are not well adapted to providing the financing required to undertake these investments. One of the reasons is the high degree of risk perceived by potential lenders. Another is the absence of correspondence between the maturity structure of the assets and liabilities that would result from such lending.

This section examines the feasibility of financing medium and long-term investments from the perspective (1) the suitability of the borrower, (2) the profitability of the investment, (3) the cash flow of the investor. Once it is determined what the conditions are that would make such lending viable, existing financial institutions are assessed to see the extent to which they could provide this financing or could perhaps be adapted to provide such financing. In the end, it is determined that a new, specialized non-bank financial institution is required.

## A. Suitability and Financial Needs of the Borrower

A key assumption of this analysis is that the medium and long-term financing being sought for the Office du Niger should originate in a financial institution that is sustainable over the longer term without recurrent subsidization. This implies that rates of interest charged must be sufficient to cover the costs of borrowing plus the cost of administering the loans, obtaining guarantees, and incurring the risk of default. The ultimate borrower – the farmer – must have a solid grasp of the technology to be employed, must be a competent manager, and must have access to a flow of resources that will be adequate over a period of years until the loan is paid off.

### *1. Characteristics of the Borrower*

There are several different types of potential borrowers in the Office du Niger. Two, which are not the object of major focus here, are the community perimeters and lease-purchase farmers. In each case, it is envisioned that the State will undertake the investment in irrigation infrastructure and land development – other than what farmers might contribute directly through their own labor. These investments will then be paid off with the assessment of a capital recovery fee in addition to the current water charge.

There are at least two important issues here. The first is whether profitability will be adequate to pay for all secondary and well as tertiary development. The analysis below suggests that this is the case as long as cultivation remains sufficiently intensive so as to maintain yields at the level of at least five tons of paddy rice per hectare. The second issue is one of maintaining an adequate cash flow for the farmer. This requires that repayments be stretched out over a sufficiently long period of time so that net revenue is always positive. The period over which payments are made will depend on the rate of interest that is being charged and the yields that the farmer obtains. The analysis presented below indicates that with yields slightly in excess of five tons per hectare and an interest rate of 12%, the period of repayment should be at least 10 to 20

years, depending on the particular mode of production, if the full cost of both secondary and tertiary investment is to be covered and if cash flow is to remain positive.

As far as private investors are concerned, many applicants do not appear to have the technical qualifications and access to sufficient capital to be considered good prospects. An analysis of 14 declared or potential candidates showed only 2 who had strong interest, sound technical qualifications, and good access to finance. Others were not interested in investing, lacked experience in the Office du Niger (and sometimes even in agriculture generally), or lacked the capital or access to capital required for the investments they were proposing. It should be noted, moreover, that many of these investments were quite large, involving anywhere from 50 to 3000 hectares (République du Mali, 1999a, pp. 18-31).

The history of the Office du Niger suggests that investments of this magnitude will not be easy to manage. Any operation of 50 hectares or more will have to involve mechanization, which has not had a good record in the Office. In fact, as noted in the introduction to this report, much of the success in raising yields within the Office du Niger has resulted from intensification of production, shifting from broadcast or in-line seeding to transplanting, and reducing the size of the average holding. With mechanization, it is difficult to organize the workforce on a scale sufficient to transplant the entire area under cultivation. The usual response is to use mechanized direct seeding. This results in lower yields and weed infestation, which requires the use of herbicides. Evidence on yields under mechanization in the Office today are scanty, but that which exists suggests yields with direct seeding on the order to 3.5 to 4 tons of paddy per hectare compared with average yields in the Office under transplanting of 6 tons. All this suggests that the transition to large-scale mechanized agriculture is not likely to be easy.

The most rapidly expanding technology in the Office is not full-scale mechanization but the introduction of power-tillers (*motoculteurs*), which are hand-operated by a team of two men and can be used for plowing, breaking up the soil, and leveling. One important advantage of power-tillers is that, unlike tractors, they can be used in the mud. This allows for much better preparation of the soil and elimination of weeds. The scale of operation – up to 20 hectares – is such that use of power-tillers can be coupled with transplanting. This allows yields to be reached that are at least equal to the Office average of 6 tons. Because of better land preparation, yields may in fact approach 7 tons/ha.

There are currently about 100 power-tillers in the Office du Niger. Demand for them is high. Parts and repair services are generally available. The people who want to shift to this intermediate technology are for the most part existing farmers with substantial experience in the Office who want to expand their scale of operations. Their major constraint is access to capital.

Other experienced farmers are experimenting with tractor operations on a relatively modest scale, seeing if these can be combined with the organization of transplanting over larger physical areas and use of herbicides to control weeds. This kind of experimentation by those with substantial experience and expertise is what is required before mechanization is introduced into the Office on a large scale. There may also be possibilities for introducing mechanized transplanting technology from Asia.

Scale of operations at the level of the individual farm is not a major constraint. The cost of a power-tiller and its related equipment can easily be amortized on as little as four hectares. A single power-tiller can be used on up to 20 hectares. Individual farmers using tractors do not have to operate on a very large scale because of the availability of tractor-hire services, though individual plot sizes may have to be increased, which can pose problems for water control.

What is required in virtually every case is an expansion of the area under cultivation. Most farmers in the Office du Niger begin as subsistence farmers producing for their families' needs. Only if they can extend the size of their farms or develop land away from their existing farms are they in a position to start producing seriously for the market. This requires access to land through one of the mechanisms that exists today in the Office.

One possibility would be for these farmers to acquire land through a lease-purchase arrangement. However, the demand for land on the part of these farmers may go beyond what is envisioned in these arrangements. Furthermore, the entrepreneurial initiative demonstrated by these farmers should be encouraged, which suggests that they should not just receive the developed land "*clé en main*".

What is needed is a category somewhere between the relatively small scale envisioned for the lease-purchase arrangements and the 50-3000 hectare scale of the private investor applications. This is the scale of loans that have been granted thus far by the *Fédération des Caisses Rurales Mutualists du Delta* (FCRMD), which have been for the development of from 10 to 70 hectares. It is at this level that existing experience within the Office can be applied in ways that offer hope for prudent innovation and expansion. It is also in this way that a substantial contribution can be made both to economic growth and to poverty reduction.

## *2. Financial Analysis of the Farm*

This section presents the results of a financial analysis of four different types of farm within the Office du Niger: manual cultivation on 4 hectares, power-tiller cultivation on 20 hectares, tractor cultivation and direct seeding on 50 hectares, and tractor cultivation and transplanting on 20 hectares. The analysis estimates benefits on the basis of a single rice crop per year. This assumption is conservative because it ignores the potential that exists for double cropping rice, or in the off-season for fruits and vegetables. Although each of these offers significant possibilities, potential constraints on water availability and market size suggest that it is preferable to exercise some caution in the calculations. Details regarding the techniques used for each farm type and the assumptions of the analysis are contained in Annex Tables A-1 through A-4.

### *Manual Cultivation*

The first farm-type is a four-hectare farm under a lease-purchase arrangement. All operations are manual, including land preparation, transplanting, and harvesting.[4] No up-front investment is

[4] Land preparation is assumed to be manual rather than with animal traction, even though the latter may be more widespread in the Office, because some farmers do not have oxen and equipment. All the evidence suggests, however, that if manual cultivation is profitable, animal traction is even more profitable.

required. The farmer repays the cost of investment in secondary (1,400,000 CFAF/ha) and tertiary (970,000 CFAF/ha) infrastructure over 20 years at a rate of interest of 12%.[5]

The results are shown in Table A-1. They indicate annual net revenue of 374,000 CFAF per farm, or 93,600 CFAF per hectare, after paying 317,000 CFAF/ha in capital recovery and 60,000 CFAF/ha in water charges for operation and maintenance. Since there are no capital investments as such made by the farmer, the cash flow is always positive and is the same in each year.

This capital recovery is much higher than that proposed in the National Rural Infrastructure Project appraisal report, which is on the order of 40,000 CFAF/ha. The difference is partly due to the higher interest rate of 12% used here in comparison with 8% used in the appraisal report. It is believed that the former more nearly reflects the opportunity cost of capital in Mali, since this is the lowest rate at which one can borrow from commercial banks.[6] The lower capital recovery in the appraisal report also results from the fact that it only covers one-half the cost of secondary infrastructure, and that cost is lower than that given for Koumouna. (World Bank, 2000, p. 52). Despite the higher capital recovery used here, the farm is profitable and cash flow is always positive by a significant margin, suggesting that the full costs of secondary and tertiary infrastructure can be recovered under lease-purchase arrangements.

*Power-tiller Cultivation*

Table A-2 shows the results for a 20-hectare farm using a power tiller for land preparation and manual operations thereafter. Substantial investments are made by the farmer in the first year with the purchase of the power tiller and a down payment on irrigation infrastructure equal to 10% of the total cost of secondary and tertiary development. Yields are assumed to remain the same as with manual cultivation. This is a conservative assumption since use of a power tiller could increase yields up to seven tons per hectare. On the other hand, overall within the Office, yields and farm size are usually inversely correlated.

Following the initial investment, net farm income after paying the full cost of secondary and tertiary investment at 12% rate of interest over 15 years equals 2.3 million CFAF per year. After the loan is paid off, net farm income rises to 8.45 million CFAF per year. The financial rate of return to the farmer is 31%. Clearly this is a very attractive investment and one which should appeal to financial institutions.

If the term of the loan is shortened to 10 years, net farm income during those 10 years declines to 1.1 million CFAF per year, and the rate of return falls to 24%. This is still an attractive investment for the farmer. On the other hand, if the period of loan repayment is shortened to 5 years, even though the internal rate of return is still an attractive 19%, net farm income is negative at –3.1 million CFAF during the period of repayment, presenting major cash flow

[5] These figures are based on estimates of investment costs for the test perimeter at Koumouna (République du Mali, 1999a, pp. 57).

[6] As seen later in the report, it is also about the lowest rate at which borrowing could take place for investment in irrigation if all the costs of the loanable funds are to be covered.

problems to the farmer. Thus loan repayments need to be stretched out over a period of at least 8-10 years.

*Tractor Cultivation*

Tractor cultivation presents significant challenges to the farmer in the Office du Niger. On one hand, the area under cultivation can be expanded, increasing net farm income. One the other hand, land preparation is less thorough than with power tillers and difficulties of organizing transplanting operations over larger areas pose significant management problems. Resort to direct seeding results in loss of yields. There is also the additional cost of herbicides.

The results of tractor operations on a 50 hectare farm are shown in Table A-3. Yields are assumed to be reduced to 4 tons/ha because of the difference in technique. With a 15 year loan at 12% rate of interest, net farm income during the period of repayment is –5.3 million CFAF. The financial rate of return is negative over a 20 year period because the total of annual net farm income over the entire period is negative, i.e., benefits do not outweigh the costs. Clearly this is not a good investment. If the loan is extended beyond 20 years, net farm income is still negative in every year.

There may be ways in which tractor cultivation could become profitable. One is if it could be combined with transplanting by reducing farm size.[7] For purposes of comparison, Table A-4 looks at this possibility by constructing a model that is identical to that of power tiller cultivation except that land preparation is undertaken with hired tractor services. Assuming that identical yields are attained, net farm income over the 15 years of repayment would be 1.5 million CFAF per year and the rate of return would be 33%. If we assume lower yields of 5 tons/ha because of less thorough land preparation, however, net farm income is negative and the rate of return declines to 4%. The situation is little improved by extending the loan to 20 years.

.

*Conclusions*

The results of the analysis are summarized in Table A.

**Table A: Results of Analysis of Farm Budgets**

| | **Manual** | **Power Tiller** | **Tractor with Direct Seed** | **Tractor with Transplanting** |
|---|---|---|---|---|
| **Number hectares** | 4 | 20 | 50 | 20 |
| **Capital (million CFAF)** | 0.0 | 7.8 | 11.8 | 4.7 |
| **Net revenue (million CFAF** | 0.4 | 2.3 | negative | 1.5 |
| **IRR (%)** | *** | 31% | negative | 33% |

**Source:** Annex Tables A-1 to A-4.

[7] As noted earlier, at least one farmer in the Office du Niger is currently experimenting with manual transplanting combined with tractor cultivation.

Several conclusions may be drawn from this analysis. First, it appears that the profitability of manual cultivation under lease-purchase arrangements is sufficiently high that farmers could pay off the cost of investment in secondary and tertiary irrigation infrastructure over 20 years. The same costs could be covered by a ten-year loan to farmers investing in irrigation using power tillers. However, a five-year repayment period would be too short and would create serious cash flow problems for the farmer.

Second, tractor operations involving direct seeding are insufficiently remunerative to pay the costs of investment in secondary and tertiary irrigation investment. If tractor cultivation could be combined with transplanting, possibly by reducing the size of the farm, full payment could be made as long as there is not too great a decline in yields associated with less thorough cultivation of the soil. There may also be possibilities for introducing mechanized transplanting technology from Asia. Financial viability depends to a very large extent on yields.

This analysis has significant implications for the type of private sector activity that is likely to be profitable in the Office du Niger. Those farming activities that are an expansion and evolution of existing intensive cultivation are much more likely to succeed than are large-scale operations that are bold departures from what already exists today. This implies that the focus of private sector credit should be on current farmers in the Office du Niger who demonstrate their willingness to innovate and expand their operations at the margin rather than on new entrants without significant experience in the Office. Credit could be made available to new entrants as well, but the viability of these applications should be scrutinized much more carefully.

## B. Suitability of Existing Financial Institutions

The total volume of existing lending in the Office du Niger is about 1.0 billion CFAF. Most of this is short-term credit used to finance the marketing of rice and the purchase of intermediate inputs. At one time, the volume of lending was considerable higher, at about 3.5 billion CFAF, but with liberalization of marketing within the Office, it became more difficult to assure repayment (Ba 1999, p. 13). Very little credit is currently available medium-term for equipment or long-term for investment in irrigation infrastructure or land development.

Existing financial institutions within the Office du Niger that undertake at least a moderate amount of lending include the *Banque Nationale du Développement Agricole* (BNDA), the *Fédération des Caisses Rurales Mutualists du Delta* (FCRMD), and the various *caisses rurales* that come under the FCRMD. In addition, a revolving irrigation fund is to be set up to finance the lease-purchase arrangements of the National Rural Infrastructure Project. Each of these sources of lending has carved out a particular niche.

### *1. Banque Nationale du Développement Agricole (BNDA)*

The BNDA is the most active lending agency for commercial credit and purchase of inputs within the Office du Niger. All told, the BNDA has 21 branches in Mali, with most of its lending concentrated in Mali-Sud to finance the marketing and export of cotton. Within the zone of the Office, the BNDA has branches at Ségou and Niono.

The BNDA has had a relatively bad experience lending to farmers within the Office. As of December 31, 1998, delinquent payments amounted to 1.5 billion CFAF (Ba 1999, p. 18), most of this owed by village associations. In general, the BNDA finances these associations of 10 to 40 farmers rather than individuals in order to minimize administration costs and reduce risks.

Much of this credit is used to purchase fertilizers and other intermediate inputs, but medium-term credit is sometimes accorded for the purchase of oxen or equipment. There has not yet been any financing of power tillers. Interest rates are usually within the range of 10-14%. Medium-term loans average about 300,000 to 1 million CFAF, and are repaid over 3 to 4 years. Collateral includes equipment, cattle, and land titles for houses. Titles for agricultural land are not considered to be very important (Interview 2000).

Some of the concerns expressed by top management of the BNDA regarding longer-term lending for the construction of irrigation infrastructure were:

- The BNDA does not have the right maturity structure of its liabilities to engage in much longer-term lending.

- Agricultural land within the Office has little value until its is developed. If a borrower defaults without developing the land, holding land title would be of little use. Nevertheless, moving to secure title will be important over the longer run in order to develop a viable land market

- There is concern that the borrower may use the land for purposes other than agriculture and thus be unable to repay the loan.

One other characteristic of the BNDA should be noted. It is owned by the Malian State. This is unlikely to change because of the important social role that the bank plays.

### *2. Fédération des Caisses Rurales Mutualists du Delta (FCRMD)*

The FCRMD is an umbrella organization that oversees the activities of the *caisses rurales mutualists* (mutual rural funds) in the region of the interior delta of the Niger River. The FCRMD headquarters is located in Niono. Recently, the FCRMD has been embarked on a very interesting lending program for investment in irrigation. The resources for this program have come in part from the reserves of the caisses rurales mutualists (50 million CFAF) and in part from USAID (100 million CFAF, on which the FCRMD pays a rate of interest equal to 4%). USAID has promised subsequent distribution of funds up to a ceiling of 770 million CFAF.

The program finances only individual farmers with at least two years of experience in the Office du Niger. Thus far the loans have been used primarily to pay for the construction of tertiary irrigation infrastructure, with secondary infrastructure usually being paid for by the Office. As of June 2001, 8 loans had been approved, varying from 7 million to 52 million CFAF, and covering anywhere from 10 to 70 hectares of land. The terms of the loans are for 5 years, with a down payment of 10% and a grace period of one year. The rate of interest equals 9%. Sixty

percent of the value of the loan is guaranteed by USAID and 40 per cent must be guaranteed by the borrower to the FCRMD through land titles, blocked accounts, or guarantees of third parties. The program is very new, but repayments thus far have been in excess of what is required.

Although very limited in its current application, this program appears to be soundly conceived. First, it focuses on existing farmers with experience in the Office du Niger. Second, it stresses adaptation of existing techniques of production rather than shifts to very different technologies. Even the one farmer who is operating on a fairly large scale of 70 hectares using tractor cultivation is also experimenting with organizing labor for transplanting so as to maintain higher yields. Third, the program concentrates on individuals who are known for their experience and competence, who are given considerable latitude in how they organize their operations, and who are held individually responsible for repayment of their loans. Despite these fairly stringent requirements, it is estimated that there is currently sufficient demand on the part of existing qualified farmers within the Office to develop an additional 1000 hectares if this type loan were more widely available.

There are a number of issues that must be resolved if this program is to be substantially expanded. One is the inconsistency that exists between the terms of these loans and those required, in principle, by the government of Mali's national irrigation strategy and the National Rural Infrastructure Project, which call for private investors to pay the full cost of both secondary and tertiary irrigation infrastructure. The analysis above suggests that this may be impossible to do for fully mechanized cultivation unless ways can be found to combine this with transplanting. Even if power tillers are used, however, the terms of the loans will have to be extended from 5 to 8-10 years. This is difficult given the current financial structure of the FCRMD, which requires that funds turn over relatively rapidly given the short-term liabilities of the *caisses rurales mutualists*.

It also should be noted that the funds provided by USAID and the FCRMD, which were supposed to be in the nature of loan guarantees, have in fact been used not as guarantees but as sources of capital. This is because the original idea was for USAID to provide a 60% guarantee in a blocked account to a bank such as the BNDA, which would back 30% of the value of the loan with its reserves and the collateral of the borrower, who would contribute the remaining 10% as a down payment. In fact, the BNDA was unwilling to enter into this agreement. The FCRMD agreed to participate, instead, but since it is not a deposit creating bank, the guarantee funds had to be used as the source of capital. This reduces the amount of leverage that the funds provide.

Finally, there is the question of whether a 10% down payment by the borrower is sufficient. It should be noted, however, that in the case of power tillers, the initial down payment for irrigation infrastructure plus the cost of equipment, which the farmer is assumed to pay, is equal to 7.74 million CFAF (Table A-2). This is a very considerable sum, which is even larger than the total value of a number of the loans given out by FCRMD thus far. It is as large as it is because, even though the farmer only contributes 10% to the cost of construction of irrigation infrastructure, he or she also has to pay for the cost of equipment. Where no equipment costs are assumed, as with tractor cultivation and transplanting, the farmer still must contribute 4.74 million CFAF as a down payment for irrigation investment on a 20-hectare farm, which is not a paltry sum.

Ways must be found to lessen this initial burden and still maintain reasonable assurances that the farmer has a sufficient stake in the operation to assure its success. One way might be for the FCRMD to lend not only for investment in infrastructure and land development but also for the purchase of equipment. In the case of power tillers, this type of loan should still be very attractive. Another way might be to reduce the area on which irrigation infrastructure is to be constructed. for the individual farmer. This will require careful coordination so that reasonable economies may be obtained in the execution of the work.

### *3. Caisses Rurales Mutualist*

The *caisses rurales mutualists* in the Delta region have some 1.6 billion CFAF in funds available for investment. About 500 million CFAF is from their deposits and 1.1 billion is in the form of a loan from the Netherlands, which is supposed to be repaid in 10 years. Most lending by the *caisses* is used to finance the agricultural campaign (80%), with 10% of loans being of very short duration for consumption and 10% in the form of medium-term loans for the purchase of oxen or equipment. Repayment rates are very high – 98% -- and interest rates charged are sufficient to cover losses.

The capacity of the *caisses* to expand their lending to include loans for investment in irrigation infrastructure is very limited. Yet they are anxious to contribute to this type of investment by some of their members, which is why they agreed to the use of 50 million CFAF of their reserves for this purpose. Should a specialized institution be created to provide for these financial needs in the Delta region, the *caisses* would very much like to participate.

### *4. National Rural Infrastructure Project*

The appraisal report for the National Rural Infrastructure Project calls for the creation of a financing mechanism which is yet to be defined. This would be a revolving fund managed by an autonomous, self-financing, privately managed financial institution responsible for the collection of prescribed contributions from beneficiaries and for the financing of new investment. For the moment, the functions of such an institution are being established in a preliminary fashion as a special unit within the Office du Niger. The concepts related to this fund, which are spelled out in the appraisal report, are to be tested first in the Koumouna I perimeter.

## C. Creation of a New *Établissement Financier*

On the basis of this assessment of the need for and supply of existing sources of finance in the zone of the Office du Niger, it is proposed to create an *établissement financier* (Δ PROMI) to meet the needs of the farmers within the zone who are interested in upgrading or expanding their operations. The primary focus of Δ PROMI would be on make two types of loans

- 8-10 year loans to farmers for the purpose of investing in secondary and tertiary irrigation infrastructure and land development;

- 3-5 year loans to farmers, millers, and others interested in purchasing equipment such as power tillers, rice hullers, etc, which would upgrade the level of technology used in the zone.

Δ PROMI would concentrate its lending activities on existing farmers with at least two years of experience in irrigated cultivation in the zone. Other loan applications could be considered but would be subject to greater scrutiny and safeguards than for existing farmers.

The size and capital structure of Δ PROMI would be dictated by the need for this kind of financing, by the likely availability of capital, and by reasonable prudential guidelines. The magnitude of immediate need, as suggested by the director of the FCRMD is 1000 hectares. Given the targeted approach suggested here and the likely availability of primary irrigation infrastructure noted in the National Rural Infrastructure Project appraisal report, this seems to be a reasonable goal to aim for in the beginning. Once experience at this level is acquired, a moderate pace of expansion may ensue. With secondary and tertiary irrigated infrastructure costing about 2.4 million CFAF/ha, and allowing some additional financing of equipment, a reasonable estimate of the total volume of initial financing is 3 million CFAF/ha, or 3 billion CFAF overall.

# III. FINANCIAL REQUIREMENTS AND SOURCES OF CAPITAL

There are a number of potential sources of capital for the proposed *établissement financier* (Δ PROMI). Some of these would provide equity capital and others loans or purchases of bond issues. In addition there is the possibility of guarantees. To the extent that the loans or bonds could be guaranteed by reputable organizations, this would reduce the cost of borrowing.

This section first examines the financial requirements of the Δ PROMI in relation to expected levels of risk and how those risks can be reduced. It then discusses alternative sources of finance to meet those requirements. The last sub-section presents a financial analysis of the flow-of funds and balance sheet of a hypothetical Δ PROMI over a period of 20 years.

## A. Financial Requirements

In general, the larger is equity relative to borrowed capital, the lower is the risk of default on a loan or bond payment. Thus those who provide the equity capital help to guarantee these payments. Also important is the degree of liquidity of the institution, so that this capital can be used to mitigate the impact of loan default. Other guarantees may be sought from institutions such as the International Finance Corporation (IFC). However, these guarantees come at a price. In order to assure capital recovery, the guaranteeing institution would charge a guarantee fee based on its assessment of the risk involved.

The financial structure of Δ PROMI should be determined by a number of requirements:[8]

- Capital-at-Risk: the amount of capital needed to avoid bankruptcy within a given time period at a given level of confidence. The higher is this level of confidence the lower is likely to be cost of guarantees.

- Return on Risk-Adjusted Capital (RORAC): expectations of shareholders regarding the return they will receive after taking into account risk. Equal to the ratio of after-tax profits to shareholders divided by the Capital-at-Risk.

- Need to establish a viable institution based on market principles and not dependent on recurrent subsidies from the government.

Although at this stage, it is difficult to specify the Capital-at-Risk with any degree of precision, it is nonetheless important to understand the concept and how it relates to the capital structure of Δ PROMI that might be envisioned.

Sources of risk are many. For the type of lending institution being considered here, the major risk is the credit risk of default on the loans that it offers to its borrowers. To the extent that these risks are known, they can be incorporated into the interest rates charged to borrowers. It is

[8] These terms are taken from Inter-American Development Bank (2000, Chapter 1)

important to keep these default rates low, however, in order to minimize the burden of default by others on those who do not default.

Capital-at-Risk is related not so much to this type of known risk, which can be internalized into the cost structure. Instead, it is related more to unexpected events that could jeopardize the lending institution, causing it to default on its borrowings and throwing it into bankruptcy. This might occur, for example, if a large number of farmers were suddenly unable to repay their loans, perhaps because of a widespread pest attack. Some of these types of events can be insured against but not all.

Other risks faced by Δ PROMI might include:

- Market risk associated with changes in prices, or interest rates prevailing in financial markets.
- Liquidity risk associated with difficulties related to financing the operations and growth of Δ PROMI.
- Business risk associated with unwillingness of farmers to borrow or other such unforeseen events.
- Operating risk due to errors in management.
- Legal risk related to the inability to enforce legal rights, for example the right to foreclose on the collateral real estate of a delinquent borrower.

Most of these risks can be minimized or reduced. For example, risk of default by Δ- PROMI's borrowers can be minimized by assuring that projects are sound and based on known technology, and that the borrowers have extensive experience with this technology. This is a major advantage of the approach advocated in this report, which departs from the record of success already experienced in the Office du Niger and advocates lending to existing farmers in the Office who want to make rather marginal changes to the known technology. Another way in which the risk of default can be reduced is to assure that the borrower contributes substantially to the Capital-at-Risk of his or her agricultural enterprise.

Market risks can be minimized by diversification, reducing market exposure, and orienting production towards more stable markets. Diversification is difficult in the Office du Niger, at least for the moment, because the greatest success has been achieved with rice cultivation. It is also hard to reduce market exposure because sales of rice are necessary in order generate the resources needed to pay off the loan. No facilities for hedging currently exist, though these might evolve in the future. On the other hand, perhaps the greatest source of market security for rice production in the Office du Niger is the fact that the West African market is relatively large and stable compared with Malian production. Furthermore, Mali is able to export rice profitably within the region (Barry 1998).

Liquidity risk can be reduced by assuring that adequate reserves are retained and that the pace of lending does not exceed the rate at which equity and borrowed capital are accumulated. Also important is to match the structure of liabilities with that of the assets (FAO 2001, p. 6). This implies that borrowed capital should be in the form of medium and long-term bonds and negotiable instruments rather then short-term bank credit. It is also important, however, that Δ PROMI remains "bankable", i.e., that it be managed in a financially sound way so that it can draw on short-term bank credit should the need arise.

Business risk of insufficient demand for loans is unlikely given the strong demand that has been expressed within the Office du Niger. Nevertheless, it would be prudent to keep overhead and administrative costs associated with borrowing very much in line with the volume of loan repayments. Donors can also assist by underwriting some of these initial costs. The possible timing of loan payments and repayments in relation to fixed overhead and variable administrative costs is analyzed later in the report.

Operating risks associated with errors in management can be reduced by selecting strong managers with sound experience in agricultural medium and long-term lending. This likely implies drawing on people who have had this type of experience in other countries.[9] Operating risks can be reduced through careful client selection and by using strong and well-tested methods of loan appraisal, supervision, and recovery (FAO 2001, p. 6). Client selection should be based, except in special circumstances, on successful previous production or processing experience in the Office du Niger, on generally favorable experience with local farmer associations and *caisses rurales*, and on a good credit history with commercial banks. Because of the long duration of the loans, close contact between the borrower and the agents of the lending institution must be maintained.

Legal risks can be minimized by understanding well the legal environment within which Δ PROMI is to operate. Contracts need to be clearly written and understood by all parties. Zero tolerance for overdue payments and arrears should be applied except in the event of very unusual circumstances for which the borrower is not responsible. Collateral foreclosure should be a last resort, but steps to be taken in the event of delinquency or default need to be carefully specified. One of the current legal issues today is the rights of the farmers regarding land title in the Office du Niger. This issue is discussed below.

## B. Sources of Capital

The medium and long-term loans required for investment in irrigation infrastructure and equipment imply greater risk of lending in the Office du Niger than if loans were confined to seasonal working capital. Virtually all the sources of risk described above are greater because circumstances can change over a period of three or more years to a much greater extent than over a single season. This has resulted in great reluctance on the part of the BNDA and other commercial banks to undertake these types of loans. This reluctance is strengthened by the fact

[9] FAO's report prepared for the World Bank on Financing Term Investments in Agriculture is based on experience with these types of loans in Bolivia, Ghana, India, Indonesia, and the Philippines (FAO 2001)

that most of their liabilities are short-term in nature, and thus not suitable to offset longer term lending.

Despite the longer-term nature of the loans required, there are a number of reasons why the type of lending proposed here in the Office du Niger carries less risk than might be expected. First, the technology is relatively well tested and understood. Even efforts to move toward tractor operations combined with transplanting are more organizational then technical in nature, and can undoubtedly be overcome as long as the area being farmed is not expanded too rapidly. Second, the proposal calls for working with existing farmers who already have experience in the Office. This implies that they are technical competent in the areas required. In addition, they are also likely to have some credit history.

Given these pluses and minuses, what sources of equity capital, loans, bond markets, and guarantees might be used to finance Δ PROMI? There are a number of potential sources at the national, regional, and international levels. The most important of these are described below.

### *1. Insurance Companies and Pension Funds*

One of the most interesting potential sources of capital within Mali and West Africa generally are the insurance companies and pension funds. These financial institutions have substantial long-term liabilities that they would like to offset with longer-term, interest-bearing assets. At present, their reserves are held to a large extent in time deposits with commercial banks, where they earn relatively low rates of interest.

Interviews with the directors of these companies in Mali and Abidjan indicated a strong interest in investing equity capital in an institution such as Δ PROMI. It would not be unreasonable, in fact, for each of the five insurance companies in Mali to invest 50 million CFAF in this way. In addition, the Institut National de Prévoyance Sociale (INPS), the Malian social security fund, has had substantial surpluses of funds in recent years that could be invested for up to 30 years. A capital contribution of 100 million CFAF might not be unreasonable. Finally there are much larger insurance companies and pension funds in Cote d'Ivoire and elsewhere in West Africa, which are under substantial pressure to invest their resources in longer term assets with higher returns than what they are receiving today. To the extent that these types of institutions do not wish to take an equity stake in Δ PROMI, they nevertheless represent a large potential market for its bonds.[10]

### *2. Individual Business Leaders*

Individual Malian business leaders were consulted and expressed an interest in participating in the equity capital of an institution such as Δ PROMI. Their major concern is to see development of the Office du Niger move forward because it is believed that all will profit from this. At the same time, however, some of them also have an interest in investing directly in the Office, which would reduce the funds they have available to invest in Δ PROMI. Nevertheless,

[10] See the section below on the West African bond market.

it appears that there would be some investment by private business leaders who are unable to invest directly in individual projects themselves, but do not want to be shut out altogether. It is difficult to estimate how much this might be, but a figure of roughly 100 million CFAF does not appear to be unreasonable. In addition, it is likely that there would be some equity participation by commercial banks such as the BNDA.

### *3. Caisses Rurales Mutualistes*

It is very clear that the *caisses rurales mutualistes* would be interested in investing equity capital in an organization such as Δ PROMI. This is evident from the fact that they have already invested 50 million CFAF in the longer-term lending activities of the FCRMD. In addition, at a meeting with farmers from the Office du Niger in Ségou in June 2001, they strongly expressed their interest in having the *caisses* make this type of investment. One reason is that they see it supporting their own plans for expansion and upgrading of technology. Another is that they want to have some say in how the organization is managed. A figure of perhaps 150 million CFAF does not appear to be unreasonable.

### *4. Regional Development Banks and Funds*

There are several regional development banks and funds that could be involved in supporting Δ PROMI through equity participation, loans, or guarantees. One is the *Banque Ouest-Africaine de Développement* (BOAD). Another is the *Banque Africaine de Développement* (BAD). Funds include the *Fonds de Solidarité Africaine* (FSA), the *Fonds de Garantie et de Coopération Economique* (FAGACE), and the *Fonds de Garantie pour les Investissements Privés en Afrique* (GARI),

The BOAD is the development finance arm of the West Africa Economic and Monetary Union (WAEMU, or UEMOA in French). It favors projects that lead to greater economic integration within West Africa or that are located in the poorer countries of the region. Δ PROMI would satisfy both criteria, given the potential that exists for rice exports from Mali to other countries in West Africa and the fact that Mali is very poor. BOAD could participate in the equity capital of Δ PROMI and/or offer loans or guarantees to the institution. A loan would have to be limited to 50% of the total cost of the project, could have a duration of up to 15 years with a grace period of up to 5 years, and would be at 10-11% rate of interest. An advantage of loans from the BOAD is that they are denominated in CFAF and thus carry no exchange rate risk.

The BAD is the regional development bank for all of Africa. It could participate in the equity capital of Δ PROMI, provide loans, and/or furnish guarantees. Equity participation could be up to 25% of total paid-in capital. Loans are limited to one-third of project cost, are for up to 12 years, with a grace period, and carry rates of interest that average 8%.

The FSA, FAGACE, and GARI are generally used to complement other sources of funding through capital participation and/ or guarantees.

### 5. *International Finance Corporation*

The International Finance Corporation (IFC) is able to take an equity participation and to provide loans. Capital participation would be limited to 30% of total paid-in capital, and there would have to be an exit strategy for the IFC later to sell its shares. Loans are limited to 25% of total cost and must be denominated in US dollars, which results in exchange rate risk. Of considerable importance, the IFC could provide guarantees on bonds issued by Δ PROMI on the West African capital market, or eventually even on the international bond market, which would assure them a AAA rating. This guarantee would carry a fee, however, which would depend on the degree of risk involved. For Δ PROMI, that fee might be on the order of 2.5% of the outstanding value of the bond issues that are guaranteed.

### 6. *West African Bond Market*

Over the longer run, one of the most important potential sources of capital for Δ PROMI is the West African bond market. At present this market is somewhat limited and illiquid, given the absence of a good secondary market. But it has considerable potential to grow and should ultimately furnish Δ PROMI with a steady source of relatively long-term capital to finance its medium and long-term loans.[11]

UEMOA provides the setting for a regional equities and bond market under the direction of the *Conseil Régional pour Epargne Publique et Marché Financier (Conseil Régional)*, established in 1996, and formalized in a regional exchange (*Bourse Régionale des Valeurs Mobilières*, or BRVM), which was set up in 1998. At about the same time, the regional central bank's (BCEAO) market-driven monetary policies and mechanisms led to the creation of a negotiable instrument market in 1996, which is regulated by the BCEAO.

The regional bond market is still nascent but has been growing rapidly since 1998. The main issuers are state governments, the BOAD, national financial institutions, and non-financial corporations. The most significant category of purchaser is the insurance companies, followed by the pension funds. In 1998, new issues amounted to 57 billion CFAF, compared with an absorptive capacity estimated at 91-127 billion CFAF, or 148-215 billion CFAF if issuance of medium-term notes were facilitated (IFC 2000, p. 7).

Thus there is considerable underutilization of the bond market. One of the reasons is the absence of an active secondary market in which bonds can be traded and to assure their liquidity. This is likely to improve in the future if costs are reduced, the regulatory system is shifted to one based on disclosure rather than merit, and tax structures are aligned.

Under the law regulating the negotiable instruments market, *bons des établissements financiers* (BEFI) can be issued for from seven days to seven years. Each issue has to have the approval of the BCEAO, but this is usually smoother than bond issues under the Conseil Regional, and

[11] The West African bond market is the subject of a recent study by the IFC (2000), which provides background for most of the analysis summarized here.

BEFIs do not have to have a guarantee. However, *établissements financiers* (EF) have to meet the prudential requirements mandated by the BCEAO.

Public offerings of bonds through the BRVM must be handled by a registered broker (*Société de Gestion et d'Intermédiation*, or SGI) and be approved by the *Conseil Régional*. At present, bond offerings require a 100% guarantee.

The most important and creditworthy issuer of bonds in the regional bond market is the BOAD. In its on the West African debt market, the IFC recommended that BOAD bonds be used as the benchmark in this market. Recently, these bonds have carried interest rates of 6.25-6.5%.

### *7. Office of Credit and Investment*

The Office of Credit and Investment of the Global Bureau, USAID supports private sector businesses through its Development Credit Authority (DCA). Under this authority, $2-30 million (1.4 – 21 billion CFAF) in investment can be guaranteed up to a maximum of 50% for up to 20 years. Denomination of the guarantee may be made in either dollars or local currency. A fee of up to 2% is charged based on utilization of the guarantee.

## C. Projected Flow-of-Funds and Balance Sheet

This section presents a projected flow-of-funds and balance sheet for Δ PROMI over its first 20 years in order to determine the timing of its need for capital, the extent to which it can meet a reasonable demand for medium and long-term loans, and the rate of return that can be expected for shareholders.

The initial analysis is based on the following assumptions:

- Initial loan disbursements of 500 million CFAF are made in Year 1. This should finance development of about 167 hectares per year. These disbursements are increased by 100 million (33 hectares) in every year thereafter. At this pace, the existing demand for 1000 hectares should be satisfied in the Year 5 of Δ PROMI's lending activities. By this time, it is assumed that demand will have increased substantially so as to allow continued increases in lending.

- Paid-in capital initially equals 1.2 billion CFAF. Subsequently additions are made to paid-in capital so as to keep it equal to at least 30% of the sum of paid-in capital plus total liabilities in the form of borrowed capital.

- Cash reserves never fall below 50% of total outstanding loans to farmers. This is a rather restrictive assumption, which assumes a high degree of risk avoidance. Nevertheless, it is in line with the uncertainties associated with extending medium and long-term loans to farmers and with the prudential requirements applied by the Banque Centrale des Etats de l'Afrique de l'Ouest (BCEAO) to all *établissements financiers*. Cash reserves are assumed to earn 2.5% rate of interest. Though this could be improved upon by holding bonds or other types of

higher-interest-earning assets, the lack of a good secondary market for these assets makes them somewhat illiquid. This situation should improve over time.[12]

- Initial borrowed capital is in the form of a 10-year, 2 billion CFAF loan from BOAD/BAD at a 10% rate of interest and a three-year grace period. Thereafter, Δ PROMI is assumed to float bonds, which are fully guaranteed by the IFC, on the West African capital market so that the interest rate paid on these bonds is only the BOAD's benchmark rate of 6.5%. However, a guarantee fee of 2.5% on the outstanding balance of principle and interest due on bonds is paid to the IFC because of the risk being assumed. By Year 11, this fee is assumed to fall to 1.5% as a result of good performance. Issuance of bonds in this market starts in Year 4 and continues annually thereafter according to the needs of Δ PROMI.

- All farmer loans are assumed to be for 10 years for the purpose of this analysis. Loan repayments by farmers are at 12%, starting in the year after the loan has been disbursed. This rate would be raised to cover the risks associated with average performance with respect to delinquency and default. Normally, it is expected that the risk premium would be no more than 2% of the outstanding loan balance, resulting in rates to farmers of no more than 14%.

- A grant from donors equal to 330 million CFAF is made available to cover the overhead cost of Δ PROMI over the first five years of its operation, or until the volume of loan repayments is sufficient to cover these costs. This cost does not include the direct cost of approving, supervising, and recovering loans, which is assumed to equal 2% of the outstanding balance of those loans. Overhead costs are assumed to equal 60 million CFAF, which is the current cost of the FCRMD, plus 0.5% of the outstanding balance of loans to cover variable supervisory cost.

The flow-of-funds analysis and the balance sheet are inter-linked so that loan and bond issues and repayments that are recorded in the flow-of-funds analysis are carried over cumulatively to the balance sheet. Net changes in cash reserves from the flow-of-funds analysis are also carried over to the Cash Reserves in the balance sheet. Total Liabilities plus Net Worth always equals Total Assets, with Net Worth being calculated as a residual. An internal rate of return (IRR) is calculated on Net Return, equal to Change in Net Worth minus Additions to Paid-In Capital.

The results of this initial analysis are shown in Tables A-5 and A-6. They indicate the feasibility of respecting the paid-in capital and reserve ratios under the assumptions presented above, but that this leads to an internal rate of return which is negative. The major reason for this is that the return on cash reserves is very low compared with the cost of borrowing or the opportunity cost of not lending these reserves to farmers. This is a major problem experienced by insurance companies, pension funds, and other institutions that hold short-term assets against their longer term liabilities.

There are two main alternatives available for solving this problem. One is to charge higher interest rates to farmers. For example, raising the base interest rate to farmers from 12% to 15% would increase the IRR to 12%. However, the financial analysis at the farm level suggests that

[12] The potential for development of a bond market in West Africa is examined in detail in IFC (2000).

this would create cash flow and rate of return problems to those activities that are somewhat marginal, especially if a risk premium is added. Furthermore, it would be undesirable to penalize farmers in order to maintain a level of security against risk for Δ PROMI that is very excessive in relation to the risks that the farmer themselves generally face.

A second alternative would be to lower the required reserve ratio. Tables A-7 and A-8 show results assuming that this ratio is lowered from 50% to 25% . This raises the IRR to 17%, a very respectable rate compared with other alternatives. Even this level of risk does not appear to be excessive since the Cash Reserve is always greater than the total value of loan repayments due from farmers in any single year. It is also in excess of the repayment obligations of Δ PROMI in every year. Although it is difficult at this point to know the probability distribution around the mean of a shortfall in farmer repayments, it appears that a major shock would have to occur several years in a row for Δ PROMI to fall delinquent on its payments, given the cash reserves maintained in Table A-8.

# IV. CONCLUSIONS, ISSUES, AND RECOMMENDATIONS

## A. Conclusions of the Analysis

The analysis presented in this report suggests that it should be financially feasible to expand irrigation in the Office du Niger and to have all costs of investment in secondary and tertiary irrigation infrastructure and land development paid for by the farmers involved. However, this will require that yields be maintained close to the level of 6 tons/ha, which is currently the average in the Office.[13] This means that transplanting will probably have to be continued for the foreseeable future. This is entirely consistent with the use of power tillers (*motoculteurs*) but may be more difficult if tractor cultivation is introduced on a large scale. Efforts to combine tractor cultivation with transplanting should be encouraged, even if this means that the size of operating units must be kept reasonably small.

The farm-level analysis suggests that market interest rates of about 12% can be paid, but that this will require that the duration of the loan must be lengthened up to 8-10 years for power tiller operations, 15 years for tractor cultivation with transplanting, and 20 years for manual cultivation. Sensitivity analysis was performed to see if this interest rate could be raised in order to cover known risks. The answer is yes, but only up to a point. That is, beyond 14-15%, the internal rate of return is substantially decreased and cash flow problems begin to be encountered.

The report surveys existing sources of finance within the Delta region and concludes that it is highly unlikely that the BNDA or another commercial bank will be interested in the type of loans needed to finance these investments. The report also suggests that it is highly desirable to build on the very successful, albeit short, experience of FCRMD in extending five-year loans to farmers. Most important is to focus on existing farmers with at least two years of experience in the Office. These farmers currently would like to develop at least 1000 additional hectares of irrigated land if they could obtain the financing. As experience is gained, it is likely that this number will increase.

The report therefore proposes the creation of a non-bank financial institution, or *établissement financier*, within the region. This institution is referred to provisionally as $\Delta$ PROMI. It would furnish 8-10 year loans for secondary and tertiary irrigation infrastructure and land development, as well as medium-term loans (3-year) for the purchase of equipment.[14] Lending would be focused on existing farmers with at least two years of experience in the Office. Others could apply but their applications would face greater scrutiny.

[13] Yields have risen rapidly over the past few years and may continue to do so for some time. However, there are likely to be limits to this increase. Consequently, the analysis is based on existing experience rather than on what may occur in the future.

[14] In some instances, loans might be extended up to 15 years where tractor operations are used with only a very modest decline in yields. This production technique, however, needs to be investigated much further before the duration of the loan is extended beyond 10 years.

According to the illustrative analysis of Section III, resources initially required for Δ PROMI include 1.2 billion CFAF in subscribed capital and 2 billion CFAF in 10-year loans from BOAD, BAD, or other lending agencies. The capital subscription appears feasible according to the interviews and other information acquired regarding possible sources of capital. The loans can be guaranteed, as required, by various funds within West Africa or by USAID's Office of Credit and Investment. In addition, according to the analysis, donors are expected to pay for the first ten years of overhead costs (not inclusive of the cost of administering the loans), which amounts to 744 million CFAF, or about one million US dollars.

From the fourth year of operations, Δ PROMI starts to float bonds on the West African capital market, with a guarantee from the IFC. The cost of interest on the bonds plus the guarantee fee saves little initially over borrowing directly from BOAD , BAD, etc. in the form of a loan, but these costs should be reduced as the financial viability of Δ PROMI is established and guarantee fees are decreased or guarantee requirements are lessened. This is in line with the move towards disclosure as the guiding principle for efficient resource allocation within this capital market.

## B. Issues

There are a number of issues that need to be resolved in the process of moving forward to create Δ PROMI.

### *1. Land Tenure*

One of the thorniest issues in the Office du Niger is that of land tenure. While financing of private sector investment in irrigation infrastructure does not appear to be threatened by lack of secure land tenure at present, given all the other problems such financing faces, lack of secure title is likely to become an increasingly important problem in the future. If Δ PROMI is to lend to farmers who are investing in irrigation and developing the land within the Office du Niger, its investors and lenders are going to require that it hold secure title to that land until the loans are repaid.

The ideal procedure would be for the title to be created and held by Δ PROMI at the time the loan is disbursed . It would then be transferred to the farmer when the loan is fully paid off. In the event of default, the land would be sold to someone else, who could borrow as necessary from Δ PROMI, with payment by the new party to the old party for investments already undertaken. Δ PROMI would continue to hold the title until the land has been fully developed according to the loan agreement.

### *2. Δ PROMI and the National Rural Infrastructure Project*

The re are several issues that need to be resolved regarding the relationship between Δ PROMI and the National Rural Infrastructure Project. One is fairly simple. Under the project, the Government of Mali is to set up an autonomous public works agency (*Agence d'Exécution de*

*Travaux d'Infrastructures et d'Equipements Ruraux*, or AGETIER), which will both undertake the necessary infrastructure construction and also manage the Irrigation Fund into which farmers under the project are to pay for the cost of that construction at the secondary and tertiary levels. It is presumed that these services can be priced and made available to private farmers for cash payment, which may be borrowed from Δ PROMI. In addition, it is also possible that private contractors could undertake the work under the supervision of AGETIER or the Office du Niger.

What may be more of a problem is to assure that the payments being made by farmers to the institution responsible for managing the financing of investments are consistent with those being paid by farmers to Δ PROMI. The appraisal report suggests that the former will be paying much less than the latter, at least as proposed here, but it is not completely clear why this is so.

A second problem arises because the FCRMD loans being financed in part by USAID are not consistent with the general principle that all secondary and tertiary irrigation construction must ultimately be recovered from the farmer. Furthermore, the rate of interest being charged is below that which is sustainable according to market principles. Although this program has been very important as a pilot effort, consistency must be established as to what the policy is regarding cost recovery and the interest rate to be charged from here on.

### *3. Scale of Lending*

The analysis contained in Tables 6-8 assumes over 20 years that 11,400 hectares of land will be place under irrigation using loans from Δ PROMI. At six tons per hectare, this implies that roughly an additional 70,000 tons of paddy will be produced. This is very modest relative to the potential that exists at the Office du Niger. Current planning, in fact, calls for irrigation to be extended over 120,000 hectares during the next 20 years. It should be recognized, however, that this is only one way in which expansion will occur. To the investments financed by Δ PROMI will be added the land put under irrigation as community perimeters, lease-purchase arrangements, and other private sector investments. Furthermore, to the extent that Δ PROMI is successful, this model can be expanded as rapidly as the availability of financial resources and the demand for loans will permit.

## C. Recommendations

The following recommendations are made regarding action to be taken in light of the analysis presented in this report.

1. The place of Δ PROMI within the broader range of options for financing investment in irrigation beyond the primary level in the Office du Niger needs to be clarified. Among the options that should be considered is that of combining the type of financial institution proposed here with the financing mechanism being studied within the context of the National Rural Infrastructure Project.

2. Efforts should be made to define clearly the extent to which and under what circumstances the cost of investment in secondary and tertiary irrigation infrastructure and land development is to be paid for by farmers in the Office du Niger. In addition, policies regarding subsidies on interest rates, risk guarantees, and other important variables need to be made clear and uniform across donors and the government.

3. Various options need to be explored regarding titling of land in the Office du Niger and which of these options is acceptable from the perspective of a newly established agency for furnishing farmers with medium and long-term loans for the purpose of investing in equipment and irrigation infrastructure in the Office. The consequences of each of these options for obtaining equity capital, loans, authority to issue bonds, and loan and bond guarantees needs to be assessed.

4. A feasibility study should be undertaken regarding the viability of establishing an *établissement financier* along the lines suggested in this report for Δ PROMI. This study should answer the following questions:

    a. What should be the Δ PROMI's institutional base and organizational structure?
    b. What should be the qualifications of the of the Managing Director and other top managers?
    c. What will be the administrative and operational costs of the Δ PROMI in relation to the volume of lending?
    d. What types of loans should be accorded by the Δ PROMI, of what duration and grace period , and at what rate of interest? What is the effective demand for these loans?
    e. What degree of confidence is there that the necessary equity capital can be raised, and from what sources?
    f. What degree of confidence is there that the necessary loans can be acquired, and from what sources and on what terms?
    g. What degree of confidence is there that the necessary bonds can be issued on the West African capital market and that the necessary guarantees can be obtained for this purpose? What constraints are there on the maturity of these bonds? What rates of interest will likely be paid?
    h. What is the degree of risk and uncertainty associated with the operations of the Δ PROMI? What is the degree of risk and uncertainty that is considered acceptable? What is the Capital-at-Risk that is required?
    i. What is the financial feasibility of the Δ PROMI, taking into account the constraints resulting from (c) through (h) above? What is the internal rate of return for the investor? What is the Return on Risk-Adjusted Capital?
    j. What level of cash reserves needs to be retained in order to keep risks at reasonable levels and yet provide stockholders with a fair rate of return? How does this relate to the BCEAO's prudential requirements?
    k. What procedure is to be used regarding land titling? If land titles are created when loans are disbursed, who is to hold the title until the loan is repaid? In the event of default, and if the Δ PROMI holds the title, what valuation is used to compensate the original investor for investments already made? If other land title arrangements are made, what are their implications?

l. What should be the pace of expansion of Δ PROMI lending and how can this be kept in line with the BCEAO's prudential requirements, and with general prudence, keeping in mind the risks involved and the degree of acceptability of those risks.?
m. What respective roles can different sources of capital best play, keeping in mind various types of risk, such as exchange rate risk?
n. How is construction work to be accomplished? What role will there be for independent private contractors?
o. Over the longer run, what relation, if any, will be established between the Δ PROMI and the financial mechanism to be established under the National Rural Infrastructure Project.?
p. Will the availability of short-term credit from commercial banks be adequate to cover working capital needs?
q. What should be the basis for determining who has access to the loans of the Δ PROMI?

# ANNEXES

## TABLEAU A-1: PROFITABILITE D'UNE EXPLOITATION DE 4 HECTARES UTILISANT L'AGRICULTURE MANUELLE

| | Unité | # Unités | F CFA/ha | # Hectares | Année 0 | Année 1 | année 2 | Année 3 | Année 4 | Année 5 | Année 6 | Année 7 | Année 8 | Année 9 | Année 10 | Année 11 | Année 12 | Année 13 | Année 14 | Année 15 | Année 16 | Année 17 | Année 18 | Année 19 | Année 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Coûts** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Activités | | | | | | | | | | | | | | | | | | | | | | | | | |
| Préparation du sol | jours | 40 | 1500 | 4 | | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 |
| Repiquage | équipe | 1 | 30000 | 4 | | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 |
| Désherbage | jours | 20 | 1500 | 4 | | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 | 120000 |
| Récolte | jours | 30 | 1500 | 4 | | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 | 180000 |
| Battage | sac de 80 kg | 75 | 37500 | 4 | | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 | 150000 |
| Engrais | | | | | | | | | | | | | | | | | | | | | | | | | |
| Urée | kg | 270 | 54000 | 4 | | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 | 216000 |
| DAP | kg | 113 | 22600 | 4 | | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 | 90400 |
| Charge d'eau | | 1 | 60000 | 4 | | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 | 240000 |
| Coûts totaux avant le remboursement du prêt | | | | | | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 | 1356400 |
| Remboursement du prêt | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secondaire | | | 1400000 | 4 | | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 | 749721 |
| Tertiaire | | | 970000 | 4 | | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 | 519450 |
| Coûts totaux après le remboursement du prêt | | | | | | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 | 2625571 |
| **Revenu** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riz | tonnes métriques | 6 | 125000 | 4 | | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 |
| **Revenu net** | | | | | | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 | 374429 |

| | |
|---|---|
| **Taux d'intérêt** | 12% |
| **Durée du prêt** | 20 |

# TABLEAU A-2: PROFITABILITE D'UNE EXPLOITATION DE 20 HECTARES UTILISANT LE MOTOCULTEUR

| | Unité | # Unités | F CFA/ha | # Hectares | Année 0 | Année 1 | année 2 | Année 3 | Année 4 | Année 5 | Année 6 | Année 7 | Année 8 | Année 9 | Année 10 | Année 11 | Année 12 | Année 13 | Année 14 | Année 15 | Année 16 | Année 17 | Année 18 | Année 19 | Année 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Coûts** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Motoculteur et équipement | | | | | | | | | | | | | | | | | | | | | | | | | |
| Investissement initial | motoculteur | 1 | 3000000 | 20 | 3000000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reparation et accessoires | | 10% | 300000 | 20 | | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| Opération Maind'œuvre extra-familiale | | 20% | 600000 | 20 | | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 |
| Repiquage | équipe | 1 | 30000 | 20 | | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 |
| Désherbage | jours | 20 | 1500 | 20 | | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 |
| Récolte | jours | 30 | 1500 | 20 | | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 |
| Battage | sac de 80 kg | 75 | 37500 | 20 | | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 |
| Engrais | | | | | | | | | | | | | | | | | | | | | | | | | |
| Urée | kg | 200 | 50000 | 20 | | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 |
| DAP | kg | 100 | 30000 | 20 | | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 |
| Charge d'eau | | 1 | 60000 | 20 | | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 |
| Coûts totaux avant le remboursement du prêt | | | | | 3000000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 |
| Remboursement du prêt | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secondaire | | | 1400000 | 20 | 2800000 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | | | | | |
| Tertiaire | | | 970000 | 20 | 1940000 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | | | | | |
| Coûts totaux après le remboursement du prêt | | | | | 7740000 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 12687253 | 6550000 | 6550000 | 6550000 | 6550000 | 6550000 |
| **Revenu** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riz | mt | 6 | 125000 | 20 | | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 |
| **Revenu net** | | | | | -7740000 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 2312747 | 8450000 | 8450000 | 8450000 | 8450000 | 8450000 |
| **Taux de rentabilité interne** | 31% | | | | | | | | | | | | | | | | | | | | | | | | |
| **Taux d'intérêt** | 12% | | | | | | | | | | | | | | | | | | | | | | | | |
| **Durée du prêt** | 15 | | | | | | | | | | | | | | | | | | | | | | | | |

# TABLEAU A-3: PROFITABILITE D'UNE EXPLOITATION DE 50 HECTARES UTILISANT LES SERVICES DE TRACTEUR/SEMIS DIR

| | Unité | # Unités | F CFA/ha | # Hectares | Année 0 | Année 1 | année 2 | Année 3 | Année 4 | Année 5 | Année 6 | Année 7 | Année 8 | Année 9 | Année 10 | Année 11 | Année 12 | Année 13 | Année 14 | Année 15 | Année 16 | Année 17 | Année 18 | Année 19 | Année 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Coûts** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Services de location de tracteur | | | | | | | | | | | | | | | | | | | | | | | | | |
| Labour | tracteur/équip | 1 | 25000 | 50 | | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 |
| Hersage | tracteur/équip | 1 | 15000 | 50 | | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 |
| Semis Direct | tracteur/équip | 1 | 10000 | 50 | | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 |
| Maind'œuvre extra-familiale | | | | | | | | | | | | | | | | | | | | | | | | | |
| Repiquage | équipe | | | | | | | | | | | | | | | | | | | | | | | | |
| Désherbage | jours | 20 | 1500 | 50 | | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 |
| Récolte | jours | 20 | 1500 | 50 | | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 |
| Battage | sac de 80kg | 50 | 25000 | 50 | | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 |
| Engrais | | | | | | | | | | | | | | | | | | | | | | | | | |
| Urée | kg | 200 | 50000 | 50 | | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 | 2500000 |
| DAP | kg | 100 | 30000 | 50 | | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 |
| Herbicide | kg | 50 | 25000 | 50 | | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 | 1250000 |
| Charge d'eau | | 1 | 60000 | 50 | | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 | 3000000 |
| Coûts totaux avant le remboursement du prêt | | | | | 0 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 |
| Remboursement du prêt | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secondaire | | | 1400000 | 50 | 7000000 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | 9249927 | | | | | |
| Tertiaire | | | 970000 | 50 | 4850000 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | 6093206 | | | | | |
| Coûts totaux après le remboursement du prêt | | | | | 11850000 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 30343133 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 |
| **Revenu** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riz | tonnes métriques | 4 | 125000 | 50 | | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 | 25000000 |
| **Revenu net** | | | | | -11850000 | -5343133,0 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | -5343133 | 10000000 | 10000000 | 10000000 | 10000000 | 10000000 |
| **Taux de rentabilité interne** | négatif | | | | | | | | | | | | | | | | | | | | | | | | |
| **Taux d'intérêt** | 12% | | | | | | | | | | | | | | | | | | | | | | | | |
| **Durée du prêt** | 15 | | | | | | | | | | | | | | | | | | | | | | | | |

# TABLEAU A-4: PROFITABILITE D'UNE EXPLOITATION DE 50 HECTARES UTILISANT LES SERVICES MOTORISES/REPIQUAC

| | Unité | # Unités | F CFA/ha | # Hectares | Année 0 | Année 1 | année 2 | Année 3 | Année 4 | Année 5 | Année 6 | Année 7 | Année 8 | Année 9 | Année 10 | Année 11 | Année 12 | Année 13 | Année 14 | Année 15 | Année 16 | Année 17 | Année 18 | Année 19 | Année 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Coûts** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Services de location de tracteur | | | | | | | | | | | | | | | | | | | | | | | | | |
| Labour | tracteur/équip | 1 | 25000 | 20 | | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 | 500000 |
| Hersage | tracteur/équip | 1 | 15000 | 20 | | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 | 300000 |
| Semis Direct | équipe | | | | | | | | | | | | | | | | | | | | | | | | |
| Maind'œuvre extra-familiale | | | | | | | | | | | | | | | | | | | | | | | | | |
| Repiquage | équipe | 1 | 30000 | 20 | | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 |
| Désherbage | jours | 20 | 1500 | 20 | | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 | 600000 |
| Récolte | jours | 30 | 1500 | 20 | | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 | 900000 |
| Battage | sac de 80kg | 75 | 37500 | 20 | | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 | 750000 |
| Engrais | | | | | | | | | | | | | | | | | | | | | | | | | |
| Urée | kg | 200 | 50000 | 20 | | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 | 1000000 |
| DAP | kg | 100 | 30000 | 50 | | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 | 1500000 |
| Charge d'eau | | 1 | 60000 | 20 | | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 | 1200000 |
| Coûts totaux avant le remboursement du prêt | | | | | 0 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 |
| Remboursement du prêt | | | | | | | | | | | | | | | | | | | | | | | | | |
| Secondaire | | | 1400000 | 20 | 2800000 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | 3699971 | | | | | |
| Tertiaire | | | 970000 | 20 | 1940000 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | 2437282 | | | | | |
| Coûts totaux après le remboursement du prêt | | | | | 4740000 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 13487253 | 7350000 | 7350000 | 7350000 | 7350000 | 7350000 |
| **Revenu** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riz | tonnes-métriques | 6 | 125000 | 20 | | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 | 15000000 |
| **Revenu net** | | | | | -4740000 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 1512747 | 7650000 | 7650000 | 7650000 | 7650000 | 7650000 |
| **Taux de rentabilité interne** | 33% | | | | | | | | | | | | | | | | | | | | | | | | |
| **Taux d'intérêt** | 12% | | | | | | | | | | | | | | | | | | | | | | | | |
| **Durée du prêt** | 15 | | | | | | | | | | | | | | | | | | | | | | | | |

# TABLEAU A-5: FLUX DE FONDS DELTA-PROMIS (ratio de réserve de 50%)
(millions de FCFA)

| | Taux d'intérêt | Durée du prêt | Année 0 | Année 1 | Année 2 | Année 3 | Année 4 | Année 5 | Année 6 | Année 7 | Année 8 | Année 9 | Année 10 | Année 11 | Année 12 | Année 13 | Année 14 | Année 15 | Année 16 | Année 17 | Année 18 | Année 19 | Année 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RECETTES** | | | | | | | | | | | | | | | | | | | | | | | |
| Capitaux Propres | | | 1200 | | | | 1000 | | | 1500 | | | 1200 | | | 1200 | | | 1000 | | | 500 | |
| Prêt BOAD sur 10 Ans, 3 années de différé | 10,0% | 10 | 2000 | | | | | | | | | | | | | | | | | | | | |
| Bonds de 5 ans , garantis par SFI | 6,5% | | | | | | 1000 | 1250 | 1250 | 1750 | 2000 | 3000 | 2500 | 2500 | 3000 | 3000 | 3000 | 3500 | 3000 | 3500 | 4000 | 3000 | 4000 |
| Remboursement par les exploitants | 15,0% | | | | 100 | 219 | 359 | 518 | 697 | 897 | 1116 | 1355 | 1614 | 1893 | 2092 | 2291 | 2491 | 2690 | 2889 | 3088 | 3288 | 3487 | 3686 |
| Dons des bailleurs | | | 747 | | | | | | | | | | | | | | | | | | | | |
| Intérêt sur les Réserves de liquidité | 2,5% | | 80 | 68 | 55 | 43 | 68 | 70 | 65 | 104 | 105 | 121 | 145 | 151 | 165 | 204 | 208 | 228 | 256 | 271 | 299 | 309 | 335 |
| Recettes Totales | | | 3200 | 0 | 100 | 219 | 2359 | 1768 | 1947 | 4147 | 3116 | 4355 | 5314 | 4393 | 5092 | 6491 | 5491 | 6190 | 6889 | 6588 | 7288 | 6987 | 7686 |
| **DEPENSES** | | | | | | | | | | | | | | | | | | | | | | | |
| Remboursement du prêt BOAD sur 10 ans | 10,0% | | | 0 | 0 | 0 | 547 | 547 | 547 | 547 | 547 | 547 | 547 | | | | | | | | | | |
| Intérêt et Principal sur le Bonds de 5 ans | 6,5% | | | | | | | 241 | 541 | 842 | 1263 | 1745 | 2226 | 2527 | 2827 | 3128 | 3369 | 3369 | 3610 | 3730 | 3850 | 4091 | 4091 |
| Garantie de paiement à SFI | 2.5%, 1.5% | | | | | | | 25 | 52 | 73 | 100 | 125 | 165 | 109 | 116 | 126 | 133 | 136 | 146 | 147 | 153 | 165 | 159 |
| Prêt sur 10 ans aux exploitants | 15,0% | 10 | | 500 | 600 | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | 2400 |
| Administration des prêts | 2,0% | | | 10 | 22 | 34 | 48 | 63 | 79 | 95 | 111 | 126 | 141 | 154 | 167 | 180 | 194 | 207 | 220 | 233 | 246 | 260 | 273 |
| Direction Générale de PROMIS DELTA | | | 60 | 63 | 65 | 69 | 72 | 76 | 80 | 84 | 88 | 91 | 95 | 98 | 102 | 105 | 108 | 112 | 115 | 118 | 122 | 125 | 128 |
| Dépenses Totales | | | 0 | 500 | 600 | 700 | 1347 | 1712 | 2140 | 2562 | 3111 | 3717 | 4338 | 4136 | 4544 | 4955 | 5301 | 5405 | 5756 | 5977 | 6203 | 6556 | 6650 |
| **Variations Nettes des Réserves** | | | 3200 | -500 | -500 | -481 | 1012 | 56 | -193 | 1585 | 5 | 638 | 976 | 257 | 549 | 1537 | 189 | 785 | 1133 | 612 | 1085 | 431 | 1036 |

# TABLEAU A-6: BILAN DE DELTA-PROMIS ( ratio de réserve de 50%)
(millions de FCFA)

| | **Année 0** | **Année 1** | **Année 2** | **Année 3** | **Année 4** | **Année 5** | **Année 6** | **Année 7** | **Année 8** | **Année 9** | **Année 10** | **Année 11** | **Année 12** | **Année 13** | **Année 14** | **Année 15** | **Année 16** | **Année 17** | **Année 18** | **Année 19** | **Année 20** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Actif** | | | | | | | | | | | | | | | | | | | | | |
| Prêts exigibles aux exploitants (a) | 0 | 500 | 1175 | 1937 | 2775 | 3679 | 4635 | 5628 | 6641 | 7654 | 8644 | 9585 | 10446 | 11307 | 12168 | 13029 | 13890 | 14751 | 15612 | 16473 | 17333 |
| moins les remboursements | | | (100) | (219) | (359) | (518) | (697) | (897) | (1 116) | (1 355) | (1 614) | (1 893) | (2 092) | (2 291) | (2 491) | (2 690) | (2 889) | (3 088) | (3 288) | (3 487) | (3 686) |
| Réserves de liquidité | 3200 | 2700 | 2200 | 1719 | 2731 | 2786 | 2594 | 4178 | 4184 | 4822 | 5798 | 6055 | 6604 | 8140 | 8330 | 9115 | 10248 | 10860 | 11944 | 12375 | 13411 |
| Total Actifs | 3200 | 3200 | 3275 | 3436 | 5147 | 5947 | 6531 | 8910 | 9709 | 11121 | 12829 | 13747 | 14957 | 17156 | 18007 | 19454 | 21249 | 22522 | 24268 | 25361 | 27059 |
| **Passif** | | | | | | | | | | | | | | | | | | | | | |
| Prêt BOAD sur 10 ans (a) | 2000 | 2200 | 2420 | 2662 | 2928 | 2620 | 2280 | 1907 | 1496 | 1044 | 547 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| moins les remboursements | | | | 0 | (547) | (547) | (547) | (547) | (547) | (547) | (547) | | | | | | | | | | |
| Bonds sur 5 ans (a) | | | | | 1000 | 2315 | 3459 | 4857 | 6276 | 8339 | 9523 | 10271 | 11248 | 11968 | 12414 | 13133 | 13399 | 13926 | 14859 | 14724 | 15324 |
| moins les remboursements | | | | | | (241) | (541) | (842) | (1263) | (1745) | (2226) | (2527) | (2827) | (3128) | (3369) | (3369) | (3610) | (3730) | (3850) | (4091) | (4091) |
| Total Passifs | 2000 | 2200 | 2420 | 2662 | 3381 | 4388 | 5192 | 6217 | 7225 | 8836 | 9523 | 10271 | 11248 | 11968 | 12414 | 13133 | 13399 | 13926 | 14859 | 14724 | 15324 |
| **Fonds Propre** | 1200 | 1000 | 855 | 774 | 1766 | 1559 | 1339 | 2693 | 2484 | 2286 | 3306 | 3476 | 3710 | 5188 | 5593 | 6321 | 7850 | 8596 | 9410 | 10637 | 11734 |
| **Total Passif plus Fonds Propre** | 3200 | 3200 | 3275 | 3436 | 5147 | 5947 | 6531 | 8910 | 9709 | 11121 | 12829 | 13747 | 14957 | 17156 | 18007 | 19454 | 21249 | 22522 | 24268 | 25361 | 27059 |
| **Taux de rentabilité interne** | | | | | | | | | | | | | | | | | | | | | |
| Variations de la Valeur actualisée Nette | 1200 | -200 | -145 | -81 | 991 | -206 | -221 | 1354 | -209 | -198 | 1020 | 170 | 233 | 1479 | 405 | 728 | 1529 | 747 | 813 | 1227 | 1097 |
| Apports aux capitaux propres | 1200 | 0 | 0 | 0 | 1000 | 0 | 0 | 1500 | 0 | 0 | 1200 | 0 | 0 | 1200 | 0 | 0 | 1000 | 0 | 0 | 500 | 0 |
| Rentabilité nette | 0 | -200 | -145 | -81 | -9 | -206 | -221 | -146 | -209 | -198 | -180 | 170 | 233 | 279 | 405 | 728 | 529 | 747 | 813 | 727 | 1097 |
| TIR | 12% | | | | | | | | | | | | | | | | | | | | |
| **Ratio** | | | | | | | | | | | | | | | | | | | | | |
| Capitaux Propres/Total Passifs+ Capitaux propres | 38% | 35% | 33% | 31% | 39% | 33% | 30% | 37% | 34% | 30% | 34% | 32% | 30% | 34% | 33% | 32% | 35% | 34% | 32% | 34% | 33% |
| Réserves de liquidité/Prêts exigibles | | 540% | 187% | 89% | 98% | 76% | 56% | 74% | 63% | 63% | 67% | 63% | 63% | 72% | 68% | 70% | 74% | 74% | 77% | 75% | 77% |

**Notes:**
(a) comprend l'intérêt accumulé sur le solde exigible.

# TABLEAU A-7: FLUX DE FONDS DE DELTA-PROMIS (ratio de réserve de 25%)

(millions de FCFA)

| | Taux d'intérêt | Durée du prêt | Année 0 | Année 1 | Année 2 | Année 3 | Année 4 | Année 5 | Année 6 | Année 7 | Année 8 | Année 9 | Année 10 | Année 11 | Année 12 | Année 13 | Année 14 | Année 15 | Année 16 | Année 17 | Année 18 | Année 19 | Année 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RECETTES** | | | | | | | | | | | | | | | | | | | | | | | |
| Capitaux Propres | | | 1200 | | | | 850 | | | 1200 | | | 1200 | | | 600 | | | | | | | |
| Prêt BOAD sur 10 Ans, 3 années de différé | 10,0% | 10 | 2000 | | | | | | | | | | | | | | | | | | | | |
| Bonds de 5 ans , garantis par SFI | 6,5% | | | | | | | 1500 | 1500 | 1000 | 2000 | 2500 | 2000 | 2250 | 2250 | 2000 | 2500 | 2250 | 2250 | 2250 | 2000 | 2000 | 2000 |
| Remboursement par les exploitants | 12,0% | | | | 88 | 204 | 350 | 531 | 743 | 973 | 1221 | 1487 | 1770 | 2071 | 2301 | 2522 | 2730 | 2920 | 3097 | 3274 | 3451 | 3628 | 3805 |
| Dons des bailleurs | | | 776 | | | | | | | | | | | | | | | | | | | | |
| Intérêt sur les Réserves de liquidité | 2,5% | | 80 | 68 | 53 | 38 | 29 | 36 | 36 | 47 | 50 | 57 | 70 | 75 | 79 | 86 | 94 | 98 | 102 | 108 | 110 | 114 | 122 |
| Recettes Totales | | | 3200 | 0 | 88 | 204 | 1200 | 2031 | 2243 | 3173 | 3221 | 3987 | 4970 | 4321 | 4551 | 5122 | 5230 | 5170 | 5347 | 5524 | 5451 | 5628 | 5805 |
| **DEPENSES** | | | | | | | | | | | | | | | | | | | | | | | |
| Remboursement du prêt BOAD sur 10 ans | 10,0% | | | 0 | 0 | 0 | 547 | 547 | 547 | 547 | 547 | 547 | 547 | | | | | | | | | | |
| Intérêt et Principal sur le Bonds de 5 ans | 6,5% | | | | | | | 0 | 361 | 722 | 963 | 1444 | 2045 | 2166 | 2346 | 2647 | 2647 | 2647 | 2707 | 2707 | 2707 | 2707 | 2587 |
| Garantie de paiement à SFI | 2.5%, 1.5% | | | | | | | 0 | 38 | 68 | 80 | 111 | 145 | 153 | 165 | 173 | 168 | 176 | 177 | 177 | 177 | 171 | 164 |
| Prêt sur 10 ans aux exploitants | 12,0% | 10 | | 500 | 650 | 825 | 1025 | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 | 2400 | 2500 | 2600 | 2700 |
| Administration des prêts | 2,0% | | | 10 | 22 | 38 | 56 | 76 | 96 | 116 | 135 | 154 | 171 | 186 | 200 | 214 | 227 | 240 | 253 | 265 | 278 | 291 | 304 |
| Direction Générale de PROMIS DELTA | | | 60 | 63 | 66 | 69 | 74 | 79 | 84 | 89 | 94 | 98 | 103 | 106 | 110 | 113 | 117 | 120 | 123 | 126 | 130 | 133 | 136 |
| Dépenses Totales | | | 0 | 500 | 650 | 825 | 1572 | 1747 | 2245 | 2737 | 3089 | 3702 | 4437 | 4119 | 4411 | 4820 | 4915 | 5022 | 5184 | 5284 | 5384 | 5478 | 5451 |
| **Variations Nettes des Réserves** | | | 3200 | -500 | -562 | -621 | -372 | 284 | -2 | 436 | 132 | 285 | 533 | 202 | 140 | 302 | 315 | 148 | 163 | 240 | 67 | 150 | 354 |

# TABLEAU A-8: BILAN DE DELTA-PROMIS ( ratio de réserve de 25%)
## (millions de FCFA)

| | Année 0 | Année 1 | Année 2 | Année 3 | Année 4 | Année 5 | Année 6 | Année 7 | Année 8 | Année 9 | Année 10 | Année 11 | Année 12 | Année 13 | Année 14 | Année 15 | Année 16 | Année 17 | Année 18 | Année 19 | Année 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Actif** | | | | | | | | | | | | | | | | | | | | | |
| Prêts exigibles aux exploitants (a) | 0 | 500 | 1210 | 2081 | 3128 | 4312 | 5534 | 6766 | 7988 | 9179 | 10315 | 11370 | 12316 | 13217 | 14078 | 14910 | 15728 | 16547 | 17365 | 18184 | 19002 |
| moins les remboursements | | | (88) | (204) | (350) | (531) | (743) | (973) | (1 221) | (1 487) | (1 770) | (2 071) | (2 301) | (2 522) | (2 730) | (2 920) | (3 097) | (3 274) | (3 451) | (3 628) | (3 805) |
| Réserves de liquidité | 3200 | 2700 | 2138 | 1517 | 1145 | 1429 | 1427 | 1863 | 1995 | 2281 | 2814 | 3016 | 3156 | 3457 | 3772 | 3920 | 4083 | 4323 | 4390 | 4540 | 4894 |
| Total Actifs | 3200 | 3200 | 3260 | 3395 | 3923 | 5210 | 6218 | 7656 | 8762 | 9972 | 11359 | 12316 | 13171 | 14152 | 15120 | 15910 | 16714 | 17596 | 18304 | 19096 | 20091 |
| **Passif** | | | | | | | | | | | | | | | | | | | | | |
| Prêt BOAD sur 10 ans (a) | 2000 | 2200 | 2420 | 2662 | 2928 | 2620 | 2280 | 1907 | 1496 | 1044 | 547 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| moins les remboursements | | | | 0 | (547) | (547) | (547) | (547) | (547) | (547) | (547) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bonds sur 5 ans (a) | | | | | 0 | 1500 | 3098 | 3914 | 5400 | 7226 | 8158 | 8760 | 9273 | 9377 | 9667 | 9727 | 9790 | 9793 | 9547 | 9284 | 9004 |
| moins les remboursements | | | | | | 0 | (361) | (722) | (963) | (1444) | (2045) | (2166) | (2346) | (2647) | (2647) | (2647) | (2707) | (2707) | (2707) | (2707) | (2587) |
| Total Passifs | 2000 | 2200 | 2420 | 2662 | 2381 | 3573 | 4831 | 5274 | 6349 | 7723 | 8158 | 8760 | 9273 | 9377 | 9667 | 9727 | 9790 | 9793 | 9547 | 9284 | 9004 |
| **Fonds Propre** | 1200 | 1000 | 840 | 733 | 1542 | 1637 | 1387 | 2382 | 2413 | 2249 | 3201 | 3556 | 3898 | 4775 | 5453 | 6183 | 6924 | 7803 | 8758 | 9812 | 11087 |
| **Total Passif plus Fonds Propre** | 3200 | 3200 | 3260 | 3395 | 3923 | 5210 | 6218 | 7656 | 8762 | 9972 | 11359 | 12316 | 13171 | 14152 | 15120 | 15910 | 16714 | 17596 | 18304 | 19096 | 20091 |
| **Taux de rentabilité interne** | | | | | | | | | | | | | | | | | | | | | |
| Variations de la Valeur actualisée Nette | 1200 | -200 | -160 | -107 | 809 | 95 | -250 | 994 | 31 | -164 | 951 | 355 | 342 | 878 | 678 | 730 | 741 | 878 | 955 | 1054 | 1275 |
| Apports aux capitaux propres | 1200 | 0 | 0 | 0 | 850 | 0 | 0 | 1200 | 0 | 0 | 1200 | 0 | 0 | 600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rentabilité nette | 0 | -200 | -160 | -107 | -41 | 95 | -250 | -206 | 31 | -164 | -249 | 355 | 342 | 278 | 678 | 730 | 741 | 878 | 955 | 1054 | 1275 |
| TIR | 17% | | | | | | | | | | | | | | | | | | | | |
| **Ratio** | | | | | | | | | | | | | | | | | | | | | |
| Capitaux Propres/Total Passifs+ Capitaux propres | 38% | 35% | 33% | 31% | 46% | 36% | 30% | 38% | 34% | 30% | 35% | 34% | 32% | 35% | 34% | 34% | 34% | 34% | 35% | 35% | 36% |
| Réserves de liquidité/Prêts exigibles | | 540% | 177% | 73% | 37% | 33% | 26% | 28% | 25% | 25% | 27% | 27% | 26% | 26% | 27% | 26% | 26% | 26% | 25% | 25% | 26% |
| **Analyse du risque** | | | | | | | | | | | | | | | | | | | | | |
| Réserves de liquidité/Remboursements des exploitants | | | 24,2 | 7,5 | 3,3 | 2,7 | 1,9 | 1,9 | 1,6 | 1,5 | 1,6 | 1,5 | 1,4 | 1,4 | 1,4 | 1,3 | 1,3 | 1,3 | 1,3 | 1,3 | 1,3 |
| Réserves de liquidité/Obligations des remboursements de prêts | | | | | | 2,1 | 2,6 | 1,6 | 1,5 | 1,3 | 1,1 | 1,1 | 1,4 | 1,3 | 1,3 | 1,4 | 1,5 | 1,5 | 1,6 | 1,6 | 1,7 |

**Notes:**
(a) comprend l'intérêt accumulé sur le solde exigible.

# REFERENCES


Ba, Ibrahim Bocar (1999), "Financement Bancaire à Moyen et Long Terme de l'Aménagement des Zones Irriguables Non-Aménagées de l'Office du Niger."

Barry, Abdoul Wahab (1998), « Promouvoir les Exportations de Riz Malien vers les Marchés Régionaux de l'Afrique de l'Ouest. » Equity and Growth Through Economic Research Project (EAGER)/Trade Regimes Project. Cambridge, MA: Associates for International Resources and Development. Avec Salif Diarra et Daouda Diarra.

Diallo, Aly (1999). "Les Contraintes à L'Investissement Privé à l'Office du Niger." Africa Trade and Investment Program (ATRIP). Table Ronde MICA-USAID/Mali de Restitution des Résultats de Recherche, Bamako, October 25-27.

Food and Agricultural Organization of the United Nations (FAO) (2001). *Financing Term Investments in Agriculture*. Report prepared for the World Bank by the Marketing and Rural Finance Service of FAO.

Inter-American Development Bank, Grupo San Santander, and Caribbean Development Bank 2000. *Financial Risk Management: A Practical Approach for Emerging Markets*. Distributed by Johns Hopkins University Press.

International Finance Corporation (IFC) (2000). *Report on the Debt Market in the UEMOA and Recommendations for its Development Strategy to the Regional Council for Public Savings and Financial Market, and the Central Bank of West African States*. November.

Interview with the BNDA branch director in Segou 2000. June 26.

Republic of Mali (1999a). Programme National d'Infrastructures Rurales, *Conditions d'Installation des Exploitants Privés sur le Perimetre Test de Koumouna*. Rapport Provisoire. October.

Republic of Mali (1999b). *Stratégie Nationale de Développement de l'Irrigation*. August.

World Bank (2000). *Project Appraisal Document on a proposed Credit in the Amount of SDR 86.7 Million (US$ 115.1 million equivalent) to the Republic of Mali for the National Rural Infrastructure Project in Support of the First Phase of the National Rural Infrastructure Program*. June 2.